Docket No.: 0630-2337PUS1
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
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Application No.: 10/538,491 Confirmation No.: 7065

Filed: June 9, 2005 Art Unit: 2837

For: METHOD FOR CONTROLLING OPERATION OF COMPRESSOR AND APPARATUS THEREOF Examiner: Michael J. Brandt

VERIFICATION OF TRANSLATION

The undersigned hereby declares the following:

That I am knowledgeable in Korean and English. That I have reviewed the Korean Priority Document No. 10-2002-0081874 and verify that the attached document is an accurate translation thereof.

All statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true. Further, these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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[Translation]

ABSTRACT OF THE DISCLOSURE

[Abstract]

An apparatus and method for driving a capacitance-variable reciprocating compressor for a refrigerator are disclosed to drive a reciprocating compressor of a refrigerator by controlling an amount of current flowing at a motor coil according to a load state of a refrigerator without using a high-priced operation control device. The apparatus for driving a capacitance-variable reciprocating compressor for a refrigerator, includes: a communicating unit for receiving an information signal with respect to a load state of the refrigerator from a microcomputer of the refrigerator; a controller for outputting a control signal to start a motor in a large capacity mode when an input of power is detected, determining a current load state of the refrigerator according to the load state information signal of the refrigerator inputted through the communicating unit, and outputting a corresponding control signal; a relay driving unit for outputting a relay drive signal for varying capacity of a compressor motor according to the control signal of the controller; and a relay switched for selecting a main coil or an auxiliary coil of the motor according to the relay drive signal of the relay driving unit.

[Representative drawing]

FIG. 2

[SPECIFICATION]

[Title of the Invention]

Apparatus and method for driving capacitance-variable reciprocating compressor for refrigerator

[Brief description of the Drawings]

FIG. 1 is a schematic block diagram showing the structure of an apparatus for controlling an operation of a reciprocating compressor according to the related art;

FIG. 2 is a circuit diagram showing the structure of an apparatus for driving a capacitance-variable reciprocating compressor for a refrigerator according to the present invention; and

FIG. 3 is a flow chart illustrating the process of a method for driving the capacitance-variable reciprocating compressor for a refrigerator according to the present invention.

**** Explanation for the major reference numerals ****

10 : communicating unit	20 : controller
30 : relay driver	40 : motor
RY : relay	

[Detailed description of the invention]

[Object of the invention]

[Field of the invention and background art]

The present invention relates to a reciprocating compressor for a refrigerator and, more particularly, to a capacitance-variable reciprocating compressor for a refrigerator capable of driving a reciprocating compressor of a refrigerator by controlling an amount of current flowing at a motor coil according to a load state of a refrigerator without using a high-priced operation control device.

In general, the reciprocating compressor does not use a crank shaft that changes a rotational movement to a linear movement, reducing a frictional loss, so it has higher compression efficiency than that of a general compressor.

When the reciprocating compressor is used for a refrigerator or an air-conditioner, freezing capacity can be controlled by varying a compression ratio of the reciprocating compressor by varying a stroke voltage inputted to the reciprocating compressor.

FIG. 1 is a circuit diagram showing the structure of an apparatus for controlling an operation of a reciprocating compressor according to the related art. As shown in FIG. 1, the related art apparatus for controlling an operation of a reciprocating compressor includes: a voltage detecting unit 14 for detecting a voltage applied to a motor 13 as the reciprocating compressor is operated; a current detecting unit 12 for detecting a current applied to the motor 13 as the reciprocating compressor is operated; a microcomputer 15 for calculating a stroke by using the voltage detected by the voltage detecting unit 14 and the current detected by the current detecting unit 12, comparing the calculated stroke and a stroke reference value, and outputting a switching control signal based on the comparison result; and a power supply unit 11 for controlling an ON/OFF operation of AC power supplied to the reciprocating motor 13 by using an internal

triac Tr1 according to the switching control signal outputted from the microcomputer 15. The operation of the related art apparatus for controlling an operation of the reciprocating compressor will now be described.

First, the stroke is varied upon receiving the voltage supplied to the motor 13 according to the stroke reference value set by the user, and a piston within the reciprocating compressor is moved up and down.

Here, the stroke refers to a distance along which the piston is reciprocally moved within the reciprocating compressor.

A turn-on period of the triac Tr1 of the power supply unit 11 is lengthened according to the switching control signal outputted from the microcomputer 15, and accordingly, the AC power is supplied to the motor 13 to drive the motor 13.

At this time, the voltage detecting unit 14 and the current detecting unit 12 detect the voltage and the current applied from the motor 13, respectively, and output them to the microcomputer 15.

The microcomputer 15 calculates a stroke by using the voltage and the current detected by the voltage detecting unit 14 and the current detecting unit 12, compares the calculated stroke with the stroke reference value, and outputs a corresponding switching control signal.

In addition, the microcomputer 15 receives current load information within a refrigerator from a microcomputer (not shown) of the refrigerator and controls driving of the compressor accordingly. The method for controlling driving of the compressor is the same as described above.

Namely, when the calculated stroke is smaller than the calculated stroke reference value, the microcomputer 15 outputs a switching control signal for lengthening the ON period of the triac Tr1 to the power supply unit 11 to increase

the stroke voltage supplied to the motor 13.

Meanwhile, when the calculated stroke is larger than the stroke reference value, the microcomputer 15 outputs a switching control signal for shortening the ON period of the triac Tr1 to the power supply unit 11 to reduce the stroke voltage supplied to the motor 13.

As stated above, the apparatus for controlling the operation of the reciprocating compressor for a refrigerator controls the ON/OFF operation of the triac Tr1 according to the load of the refrigerator, so it can precisely control the stroke, but because it uses a high-priced digital signal process (DSP), a cost for implementing the apparatus increases.

[Problem to be solved by the invention]

Therefore, an object of the present invention is to provide an apparatus and a method for driving a capacitance-variable reciprocating compressor for a refrigerator capable of driving the reciprocating compressor by controlling an amount of current flowing at a motor coil according to a load state of the refrigerator without using a high-priced operation control device.

[Construction of the invention]

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided an apparatus for driving a capacitance-variable reciprocating compressor for a refrigerator, including: a communicating unit for receiving an information signal with respect to a load state of the refrigerator from a microcomputer of the refrigerator; a controller for outputting a control signal to

start a motor in a large capacity mode when an input of power is detected, determining a current load state of the refrigerator according to the load state information signal of the refrigerator inputted through the communicating unit, and outputting a corresponding control signal; a relay driving unit for outputting a relay drive signal for varying capacity of a compressor motor according to the control signal of the controller; and a relay switched for selecting a main coil or an auxiliary coil of the motor according to the relay drive signal of the relay driving unit.

To achieve the above object, there is also provided a method for driving a capacitance-variable reciprocating compressor, including: a first step in which when power is inputted, the compressor starts in a large capacity mode, and it is checked whether a certain time has lapsed; a second step in which when the certain time has lapsed, the current operation mode is changed to a small capacity mode for driving; a third step in which a current load of the refrigerator is detected to check whether it is an overload; and a fourth step in which when the current load is an overload, the compressor is operated in the large capacity mode, and if the current load is not an overload, the compressor is operated in the small capacity mode.

The operation and effect of the apparatus and method for driving the capacitance-variable reciprocating compressor according to the present invention will now be described with reference to the accompanying drawings.

FIG. 2 is a circuit diagram showing the structure of an apparatus for driving a capacitance-variable reciprocating compressor for a refrigerator according to the present invention.

As shown in FIG. 2, the apparatus for driving the capacitance-variable

reciprocating compressor for a refrigerator includes: a communicating unit 10 for receiving an information signal with respect to a load state of the refrigerator from a microcomputer of the refrigerator; a controller 20 for outputting a control signal to start a motor in a large capacity mode when an input of power is detected, determining a current load state of the refrigerator according to the load state information signal of the refrigerator inputted through the communicating unit 10, and outputting a corresponding control signal; a relay driving unit 30 for outputting a relay drive signal for varying capacity of a compressor motor according to the control signal of the controller 20; and a relay RY switched for selecting a main coil M1 or an auxiliary coil M2 of the motor according to the relay drive signal of the relay driving unit. The operation of the present invention will now be described.

First, when AC power is inputted to the refrigerator, the controller 20 applies a control signal for starting an initial motor in a large capacity mode to the relay driving unit 30, and accordingly, the relay driving unit 30 switches the relay RY to select to the main coil M1. Then, the AC voltage is applied to the motor 40 through the main coil M1 and the motor 40 of the reciprocating compressor is driven.

While the motor 40 is operated in the large capacity mode, when a certain time lapses, the controller 20 applies a control signal for operating the refrigerator in a small capacity mode to the relay driving unit 30, and accordingly, the relay driving unit switches the relay RY to select the auxiliary coil M2. Then, the AC voltage is applied to the motor 40 through the auxiliary coil M2 and the motor 40 of the reciprocating compressor is driven.

In this state, the controller 20 determines a load upon receiving

information on temperature, Eva temperature, ambient temperature, etc., from a microcomputer of the refrigerator through the communicating unit 10, and operates the compressor in the large capacity mode or in the small capacity mode based on the determined load result.

Namely, when temperature information within the refrigerator is higher than a pre-set reference temperature, the controller 20 determines an overload, operates the compressor in the large capacity mode to rapidly lower the temperature within the refrigerator. If the temperature within the refrigerator is lower than the pre-set reference temperature, the controller 20 operates the compressor in the small capacity mode.

The operation of driving the capacitance-variable reciprocating compressor for a refrigerator according to another embodiment of the present invention will now be described in detail with reference to FIG. 3.

FIG. 3 is a flow chart illustrating the process of a method for driving the capacitance-variable reciprocating compressor for a refrigerator according to the present invention.

First, when power is inputted, the controller 20 starts the compressor in the large capacity mode (SP1 and SP2).

Next, the compressor starts, and when a certain time lapses, the controller 20 switches the relay RY to select the auxiliary coil M2 in order to change the current mode to the small capacity mode, and accordingly, the power is applied to the compressor motor 40 through the auxiliary coil M2 to drive the compressor such that weal cooling air can be supplied into the refrigerator (SP3 and SP4).

In such a state, a current load of the refrigerator is detected (SP5), and it is checked whether the load is an overload (SP6).

In this case, the load of the refrigerator is determined by detecting the current internal temperature of the refrigerator, and the temperature or ambient temperature of the compressor.

When the current load of the refrigerator is an overload, the controller20swtiches the relay RY to select the main coil M1 to drive the compressor in the large capacity mode, and accordingly, when power is applied to the compressor motor 40 through the main coil M1, strong cooling air is supplied into the refrigerator to lower the temperature within the refrigerator (SP7).

If the current load of the refrigerator is not an overload, the compressor is continuously driven in the small capacity mode (SP8).

Thus, the capacity of the reciprocating compressor for a refrigerator can be stably varied without using a high-priced operation control device.

[Effect of the invention]

As so far described, according to the present invention, the compressor is driven by controlling the amount of current flowing at the motor coil according to the load state of the refrigerator, so that the implementation cost can be reduced.

What is claimed is:

1. An apparatus for driving a capacitance-variable reciprocating compressor for a refrigerator, comprising:

a communicating unit for receiving an information signal with respect to a load state of the refrigerator from a microcomputer of the refrigerator;

a controller for outputting a control signal to start a motor in a large capacity mode when an input of power is detected, determining a current load state of the refrigerator according to the load state information signal of the refrigerator inputted through the communicating unit, and outputting a corresponding control signal;

a relay driving unit for outputting a relay drive signal for varying capacity of a compressor motor according to the control signal of the controller; and

a relay switched for selecting a main coil or an auxiliary coil of the motor according to the relay drive signal of the relay driving unit.

2. The apparatus of claim 1, wherein when the current load of the refrigerator is an overload, the controller switches the current refrigerator operation mode to the large capacity mode, and when the current load of the refrigerator is not an overload, the controller continuously operates the current refrigerator operation mode as the small capacity mode.

3. A method for driving a capacitance-variable reciprocating compressor, comprising:

a first step in which when power is inputted, the compressor starts in a

large capacity mode, and it is checked whether a certain time has lapsed;

a second step in which when the certain time has lapsed, the current operation mode is changed to a small capacity mode for driving;

a third step in which a current load of the refrigerator is detected to check whether it is an overload; and

a fourth step in which when the current load is an overload, the compressor is operated in the large capacity mode, and if the current load is not an overload, the compressor is operated in the small capacity mode.

FIG. 1

12 : current detecting unit

14 : voltage detecting unit

15 : microcomputer

스트로크지령치 : stroke reference value

FIG. 2

30 : relay driving unit

20 : controller

10 : communicating unit

냉장고내 온도, Eva 온도 주위 온도 : internal temperature of refrigerator, Eva temperature, ambient temperature

FIG. 3

SP1 : inputting power

SP2 : starting in large capacity mode

SP3 : certain time?

SP4 : operating in small capacity mode

SP5 : detecting load

SP6 : overloaded?

SP7 : operating in large capacity mode

SP8 : operating in small capacity mode